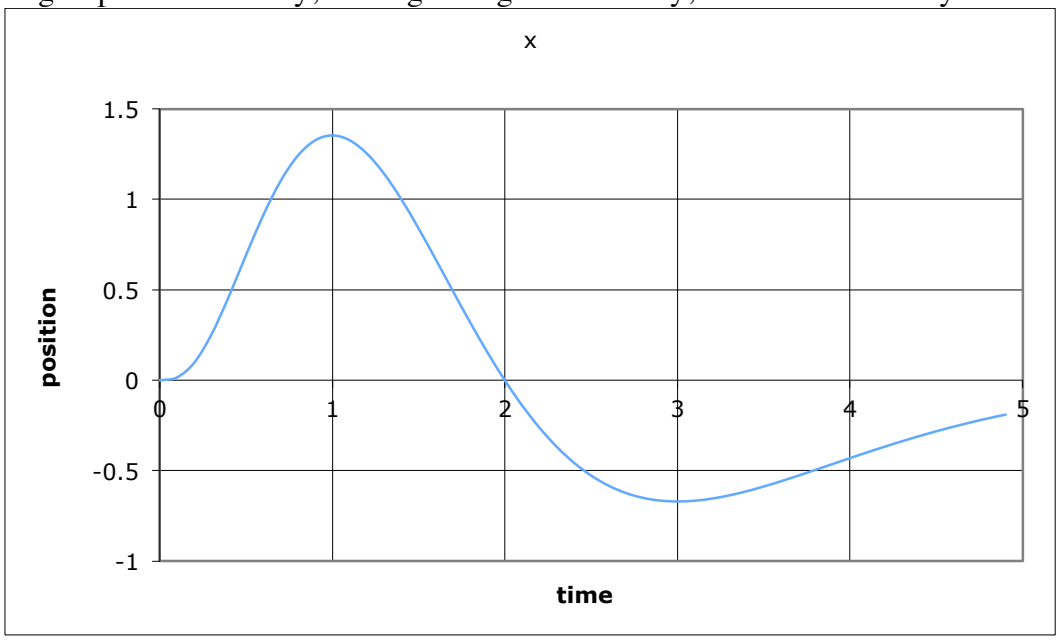
Physics 131
General Physics I
Grinnell College

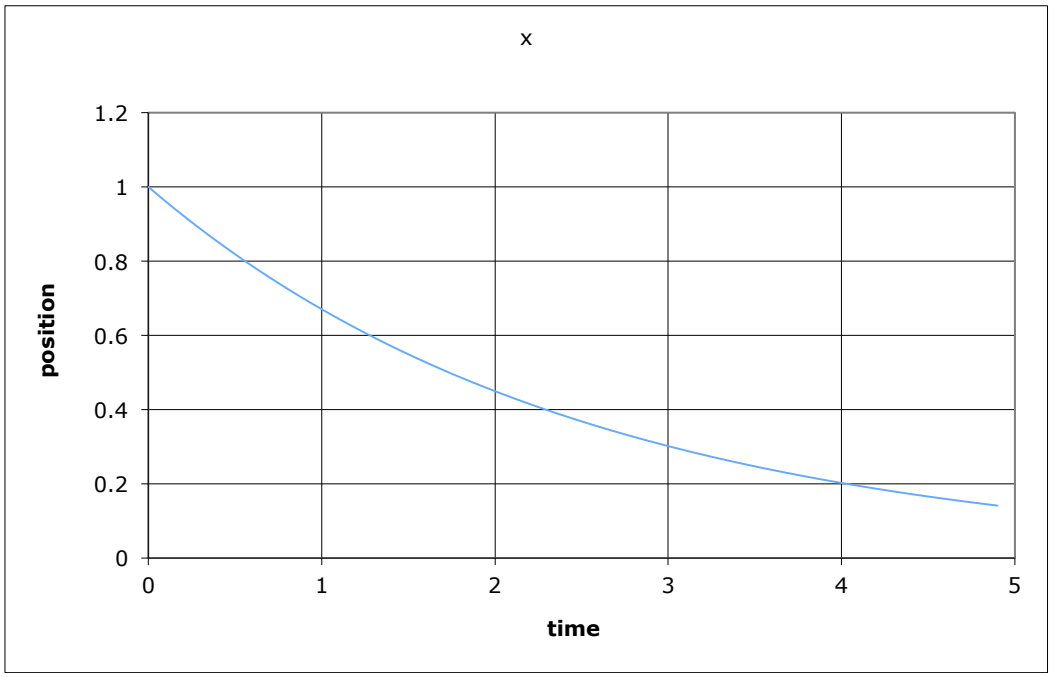
Homework I

Session I.1

1. For the following distance versus time graph, which points (if any) correspond to the largest positive velocity, the largest negative velocity, and to zero velocity?

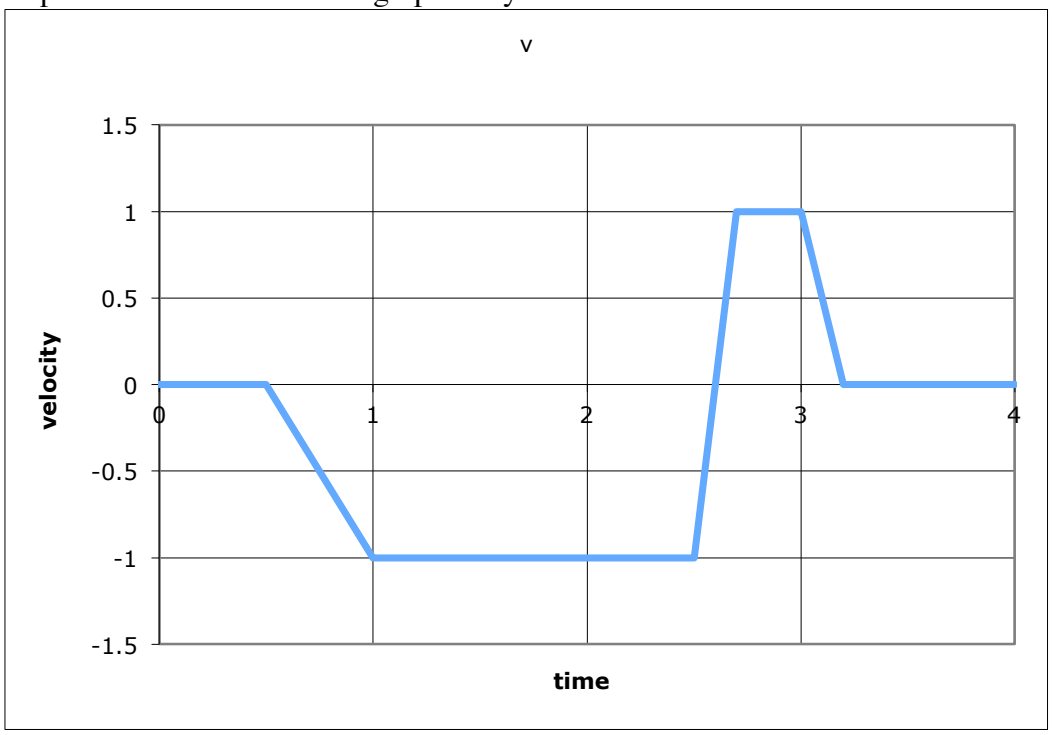


2. For the following distance versus time graph, which points (if any) correspond to the largest positive velocity, the largest negative velocity, and to zero velocity?



3. Draw a graph of position versus time for a small positive constant velocity, and one for a large negative constant velocity

4. The following graph is a velocity versus time graph. Does this correspond to a net motion forward (larger distance values at time 4 seconds than at time zero) or backward? Explain what features of the graph tell you that.



Session I.2

5. Use your velocity calculating spreadsheet to calculate the velocity from t=0 to 10 sec. if the position function is

$$x = \sin(2t).$$

Attach your graph.

6. Use your knowledge of calculus to calculate the velocity function directly using

$$v = \frac{dx}{dt}.$$

Graph the resulting function using Excel and see if it agrees with your result from problem #5.

7. Repeat #5 for the function

$$x = e^{-2t}.$$

8. Repeat prob. #6 for the same function as in #7, and compare your results to those of #7.

Session II.1

9. You throw a ball up into the air from your hand. It goes up a couple of meters, comes down, and you catch it. Consider up to be the positive direction. When does the ball have its largest positive velocity? When does it have the largest (in magnitude) negative velocity? When does it have its smallest (in magnitude) velocity? Explain your answers in a few words.

10. An object starts at position x = 3 m, moves -2 m/sec for 10 seconds. What is its final location? Explain your answer in a few words.

11. A car starts at rest, accelerates smoothly, then slows and stops completely at a stop sign. Sketch plausible x(t) and v(t) graphs for this motion. Give a few words of explanation.

12. The result we found in class for freefall from rest ($x - x_o = \frac{1}{2}at^2$) is true for any constant acceleration. Let's use it to analyze the performance of my new car.

a) My car goes from 0 mph to 60 mph (26.8 m/sec) in 10 seconds. What is the acceleration, assuming the acceleration is constant?

b) How far will I have traveled in those 10 seconds? Give your answer in meters.